While I regret having incorrectly inferred Mr. Hannay's claims, readers of the paper to which he refers will, I think, perceive that the error was not without some justification.

Trinity College, Dublin. J. Joly.

The New Comet.

The comet discovered here on March 26 was re-observed on the 27th, 28th, 29th, 30th, 31st, and April 1st, 2nd, and 3rd, and its places on four nights were determined as follows:—

1894	G.M.T.	R.A.	Decl.
	h. m.	h. m. s.	° ′
March 26	9 30	9 54 37	+32 13
27	10 30	9 58 32	+31 38
30	9 50	10 9 12	+30 1
31	11 15	10 12 48	+29 27

The motion is becoming slower, whence it may be inferred that the perihelion passage occurred some time ago.

The comet is small and faint, with a stellar nucleus of about 12th magnitude and a short fan-shaped tail. It was discovered with a 10 inch reflector and comet eyepiece magnifying thirty times. To my eye the comet is now decidedly more obvious than it was when first seen, but this may either be due to more favourable atmosphere, or to the fact that greater familiarity with an object is apt to render it plainer.

Bristol, April 4. W. F. Denning.

Sun-spot Phenomena and Thunderstorms.

A small portion of that most interesting field of research again dealt with in Nature (vol. xlix. p. 503), perhaps requires to be trodden with caution. Of course all *a priori* reasoning as to probabilities of a connection between solar physics and the occurrence of thunderstorms may be laid aside, and it does not seem that writers on the subject have fallen into that kind of anti-scientific error. At the same time, we readily admit that a connection between solar activity and thunderstorm phenomena exists. But having devoted a little time to the consideration of the question, I may be permitted to make a remark. In the first place, so far as our observations at present extend, it is quite impossible to find a distinct relation of time between prevalence of thunderstorms over our planet and solar periodicities. In the second place, thunderstorms have been classified, and much require further classification (to which, by the way, I am just about to contribute a few results of study). Artificial or conventional classification would by no means be an object of pursuit to Dr. Veeder. Natural classification does not seem to bring us now at all near to the connection which we might anticipate. In fact, it seems to me that in reference to the thunderstorms mentioned in Nature for March 29, 1894, natural classification leads us away from the connection.

April 2. W. Clement Ley.

A Lecture Experiment.

The following experiment, to illustrate the anomalous contraction and expansion of water due to decrease of temperature, I have found to be very striking:—

A large test tube is fitted with a cork, through which a glass tube passes just far enough to allow a rubber tube to be attached. The rubber tube should be long enough to reach to the bottom of the test tube. Close the lower end of the rubber tube, and fill it and the glass tube with mercury up to a little above the top of the cork. Fill the test tube with water, insert the rubber tube, and cork and press the latter firmly in place, taking care that no air-bubbles are imprisoned between it and the water. The pressure of the cork against the surface of the water will cause the mercury to rise in the glass tube. Place the apparatus thus prepared into a freezing mixture of ice and salt. The mercury will fall slowly in the tube until the water has attained its maximum density, remain stationary for a moment, then rise on the further cooling of the water, and at the instant of freezing will make a rapid movement upward.

Armour Institute, Chicago, U.S.A. J. C. Foye.

Centipedes and their Young.

The members of the Trinidad Field Naturalists' Club will be glad if any of your correspondents can throw additional light upon the following facts in the history of centipedes, which have recently come under their notice:—

On September 17, 1892, Mr. Charles Libert, of this town, sent to Mr. R. R. Mole a centipede (*Scolopendra prasina*) which enclosed in a circle formed of the fore part of its body a circular mass of young centipedes about the size of a halfpenny, and about quarter of an inch thick. The young ones were quite white. The old centipede was very vicious. The centipede and the young ones were exhibited at a conversazione of the Victoria Institute the same evening. The old centipede did not alter her position at all, and on the 21st was packed up for transmission to the Gardens of the Zoological Society, London. Dr. Sclater wrote, on October 27, to Mr. Mole stating that the centipede was dead on arrival, and only one young one could be found in the box. Mr. Libert informs me that he has once or twice found young centipedes clinging to various parts of the body of an adult. Mr. T. D. A. Cockerell (late of Jamaica), of whom inquiries were made, said this habit was new to him.

At a meeting of the Trinidad Field Naturalists' Club on July 7, 1893, the President (Mr. Caracciolo) exhibited a sketch of a centipede carrying its young between the legs of the anterior twelve segments of its body. He stated that he received the centipede, from which the sketch was made, from Mr. Guiseppi on June 20. The creature protected her young in this manner until June 25, when she altered her position, and lay flat over them. On June 30 she left them, "but kept an eye on them." When undisturbed the young centipedes formed a heap, in which they remained for four days. They then gradually began wandering away from the heap, one by one, in search of food. There were about 140 young ones altogether.

At the meeting of the Club on February 2, 1894, Mr. Potter said he had been told by Mr. S. W. Knaggs that he had recently found a centipede coiled up spirally on itself. On attempting to uncoil it a number of pellets of small size fell from its under-surface. These bore the appearance of eggs. He subsequently found others clasped by the numerous legs against the creature's under-surface. The pellets, or eggs, were situated all along the under-surface of the body, and dropped from it on its being uncoiled.

Several text-books and works on natural history have been consulted with the view of finding out more about this interesting habit, but without success; and in most books it is stated that centipedes lay their eggs under dead leaves, or in a dark corner, and manifest no further concern about them.

F. W. Urich.

Port of Spain, Trinidad, B.W.I., March 6.

PROF. IRA REMSEN ON CHEMICAL LABORATORIES.[1]

On January 1 the Kent Chemical Laboratory was dedicated with appropriate exercises. The beautiful building was thrown open to inspection, and many passed through its rooms expressing admiration. Its plans were explained and a general account was given of the uses to which it is to be put. Honour, "as is most justly due," was paid to the generous donor, whose name from this day forth will be intimately associated with progress in chemistry in this country. The exercises of yesterday have led by an easy step to those of to-day, and a chemist is called upon to give the Convocation address. What theme more natural to him, or more appropriate, than "The Chemical Laboratory?" It is to this theme that I ask your attention. My purpose is to treat the chemical laboratory, not from the material point of view, but in its broader aspects, as far as I may find this possible. I shall attempt to answer briefly three questions, and these are:—

(1) When and how did chemical laboratories come to be established in universities?

(2) What part have chemical laboratories played in the advancement of knowledge?

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[1] Address delivered by Prof. Ira Remsen on January 2, 1894, in connection with the opening of the Kent Chemical Laboratory of the University of Chicago, U.S.A.

(3) What are the legitimate uses of the chemical laboratory of a university at the present time in this country?

The first laboratory ever erected for the teaching of chemistry—indeed, the first laboratory for teaching any branch—was that of the University of Giessen, Germany, which owed its existence to the enthusiasm of Liebig. The story is an interesting one, and especially instructive on an occasion such as this. Liebig was born in the year 1803. According to his own account, he had a hard time of it in the schools. He says: "My position at school was very deplorable; I had no ear-memory, and retained nothing or very little of what is learned through this sense. I found myself in the most uncomfortable position in which a boy could possibly be; languages and everything that is acquired by their means, that gains praise and honour in the school, were out of my reach; and when the venerable rector of the gymnasium, on one occasion of his examination of my class, came to me and made a most cutting remonstrance with me for my want of diligence—how I was the plague of my teacher and the sorrow of my parents, and what did I think was to become of me—and I answered him that I would be a chemist, the whole school and the good old man himself broke into an uncontrollable fit of laughter, for no one at that time had any idea that chemistry was a thing that could be studied."

This was truly an unpropitious beginning, yet this butt of his school was soon contributing more to the development of chemistry than any one ever had before or than any one ever has since. Filled with the determination to study chemical things and phenomena, he left the school where he had been such a failure, and entered an apothecary shop, but at the end of ten months the proprietor was so tired of him that he sent him back to his father. As Liebig said, he wanted to be a chemist, not a druggist. He must have been about fifteen years of age when, in spite of his inadequate preparation in languages, he was received as a student in the University of Bonn, and from here a little later he went to Erlangen. But he appears not to have been much better satisfied at the university than he was in the apothecary shop. He speaks almost with contempt of the teachers under whom he studied. "It was then a very wretched time for chemistry in Germany," he says. "At most of the universities there was no special chair of chemistry; it was generally handed over to the Professor of Medicine, who taught it, as much as he knew of it—and that was little enough—along with the branches of toxicology, pharmacology, materia medica, practical medicine, and pharmacy." Referring to the equipment of the universities for the teaching of chemistry, he says: "I remember, at a much later period, Prof. Wurzer, who had the chair of chemistry at Marburg, showing me a wooden table-drawer, which had the property of producing quicksilver every three months. He possessed an apparatus which mainly consisted of a long clay pipe-stem, with which he converted oxygen into nitrogen by making the porous pipe-stem red-hot in charcoal, and passing oxygen through it. Chemical laboratories, in which instruction in chemical analysis was imparted, existed nowhere at that time. What passed by that name were more like kitchens fitted with all sorts of furnaces and utensils for the carrying out of metallurgical or pharmaceutical processes. No one really understood how to teach it."

After a comparatively short sojourn in Erlangen, Liebig returned home fully persuaded that he could not attain his ends in Germany. Some of the young men of that time had gone to Stockholm to study chemistry, attracted thither by the fame of the great Berzelius. But Liebig decided in favour of Paris. He was then seventeen and a half years old, and, as we have seen, he could not have been well prepared in chemistry, yet in a short time after his arrival, he made such an impression on Alexander von Humboldt that he was admitted to the laboratory of one of the most brilliant chemists of the day, Gay-Lussac. He had previously begun an investigation on certain fulminating compounds to which his attention was first directed in a curious way at his home in Darmstadt.

Let me again use his own words: "In the market at Darmstadt I watched how a peripatetic dealer in odds and ends made fulminating silver for his pea-crackers. I observed the red vapours which were formed when he dissolved his silver, and that he added to it nitric acid, and then a liquid which smelt of brandy, and with which he cleaned dirty collars for the people." Gay-Lussac gladly joined him in the investigation, and he gratefully refers to this opportunity. He acknowledges that the foundation of all his later work was laid in Gay-Lussac's laboratory.

And now to the main point. When Liebig was in his twenty-first year he received an appointment to a professorship of chemistry at Giessen through the influence of von Humboldt. His opportunity had come. He determined to have a laboratory for teaching. The great advantages he had reaped from his contact with Gay-Lussac showed him clearly that if students were to study chemistry at all it must be in a well-equipped laboratory in contact with a teacher. And so the first laboratory was built, and became one of the great forces of the world. Soon students flocked to the little university from all parts of the civilised world, and the most flourishing and powerful school of chemistry that has ever existed was rapidly developed. One of the most brilliant pupils of this school, the late Prof. Hofmann, of Berlin, in speaking of its influence, says: "The foundation of this school forms an epoch in the history of chemical science. It was here that experimental instruction such as now prevails in our laboratories received its earliest form and fashion; and if, at the present moment, we are proud of the magnificent temples raised to chemical science in all our schools and universities, let it never be forgotten that they all owe their origin to the prototype set up by Liebig." The foundation of this school marked an epoch not only in the history of chemical science but in the history of science. The great success of this laboratory led naturally to the building of others, and in a comparatively few years a chemical laboratory, at least, came to be regarded as essential to every university. At first these were of necessity modest affairs. One of the earliest was that at Tübingen, in regard to which a curious fact may be mentioned. It appears that the ground available for Liebig's laboratory in Giessen was not altogether well adapted to its purpose, and in consequence, one of the larger working-rooms received light from only one side. When the laboratory of Tübingen was built later, that at Giessen was copied in every detail even to the dark room, notwithstanding the fact that there were no buildings in the immediate neighbourhood, and light in abundance was available.

As time passed, the era of the palatial laboratory was introduced. Probably we shall be very near the truth if we fix the responsibility of this era upon Bonn. Hofmann was called to Bonn from England, whither he had gone under the most flattering conditions, and, before accepting the new call, he had, no doubt, received promises with reference to a laboratory. At all events, a building was erected, much finer than anything in the way of a laboratory that had ever appeared. As is customary in Germany, the professor's dwelling-rooms were in the building, and so beautiful were all the arrangements, that when the King of Prussia passed through at the time of the formal opening, he is said to have remarked, "I should like to live here myself." Soon after this Hofmann built the laboratory at Berlin, and again magnificence was the order of the day. Statues and carvings, and tiles and frescoes, took their place in the laboratory, and since then in Germany and France and Austria and Switzerland immense sums have been expended in the erection not only of chemical but of physical, and physiological, and petrographical, and anatomical, and pharmacological, and geological laboratories. While of late years there has perhaps been a reaction, and a tendency to somewhat simpler buildings than those that at one time were the fashion, it is still true that the laboratories are semi-palatial, and a strict economist might find ground for complaint, claiming that results as good might have been obtained at smaller cost. It would hardly be profitable to discuss this point here. In this country we cannot be said in general to have been extravagant in building laboratories; certainly not, if we keep the European standard in mind. Most of the larger laboratories in this country are modest in their fittings, and the strictest economist could hardly find fault.

If we had the power to estimate the value of the work that has been done for the world by the scientific laboratories, it is certain that the money spent for them, however great the sum may be, would appear to us ridiculously small. The scientific method, as it is called, has been spread among men, and has changed the whole aspect of things. The influence of the laboratory is felt in every branch of knowledge. The methods of investigation have changed, and everywhere the scientific method has been adopted. Who can tell what an enormous influence this has already had upon the thoughts and actions of men, and what still greater influence is to be exerted? The laboratory has impressed upon the world the truth that in order to learn about anything it will not suffice to stand aloof and speculate, and that it is necessary to come into as close contact with that thing as possible. When the old philosopher wished to solve a problem, his method was to sit down and think about it. He relied upon the workings of his brain to frame a theory, and beautiful theories were undoubtedly framed, and many of these, probably all of those which had reference to natural phenomena, were far in advance of facts known, and often directly opposed to facts discovered later. Minds were not hampered by facts, and theories grew apace. The age was one of mental operations. A beautiful thought was evidently regarded as something much superior to knowledge. We have not learned to think less of beautiful thoughts or of mental processes, but we have learned to think more of facts, and to let our beautiful thoughts be guided by them.

And how did this come about? It is curious that the scientific method of work, which is altogether the simplest, should be the last to be adopted by the world as it is by individuals. It would be impossible to determine all the causes that have led to this result, but one of the immediate causes is undoubtedly to be found in the fact that, at an early period in the history of the world, those who worked with their hands came to be looked upon as inferior to those who worked with their heads alone. This operated powerfully to keep those who were best fitted to advance knowledge, from adopting the simplest method, viz. that of studying things. One who engaged in experiment did it surreptitiously, or lost caste.

Probably the most powerful force that first led men to experiment systematically was the conception of the philosopher's stone, and out of the labours of the alchemists sprang experimental science. Strange as it may seem, it was the love of gold that led to the development of scientific methods of investigation. In some way, probably through superficial observations, men came early to think it possible that the ordinary or base metals could be transformed into gold, and with this idea came the desire to experiment on the subject, and the experiments on this subject have been kept up until the present century. So that in one sense, certainly, it is not true that "the love of money is the root of all evil." While much folly was committed in the name of alchemy—as much folly is committed to-day in the name of chemistry, and of medicine, and of other lines of work—it is clear that the true alchemist was as ardent a worker as the world has perhaps ever seen; he was engaged in experimenting. He was teaching the world that the way to a correct knowledge of nature lies not in philosophy alone but through coming in contact with the things of nature, and becoming personally acquainted with them. Paracelsus speaks of the alchemists of his time thus: "They are not given to idleness, nor go in a proud habit, or plush or velvet garments, often showing their rings upon their fingers, or wearing swords with silver hilts by their sides, or fine and gay gloves upon their hands, but diligently follow their labours, sweating whole days and nights by their furnaces. They do not spend their time abroad for recreation, but take delight in their laboratory. They wear leather garments with a pouch, and an apron wherewith they wipe their hands. They put their fingers among coals, and into clay, not into gold rings. They are sooty and black like smiths and colliers, and do not pride themselves upon clean and beautiful faces."

This is certainly the picture of a hard worker, and as such we must look upon the alchemist. The work done by the alchemists was chemical work. It was allied very closely to the work done by chemists now-a-days. They hoped to find the philosopher's stone among chemical substances, and the transformation they hoped for was to be accomplished by a chemical method. They consequently devoted themselves to careful study of all known chemical substances, and in further studying the action of these substances upon one another they came into possession of new facts. There can be no doubt that we owe to the alchemists not only the foundation of chemistry, but the foundation of experimental science. In our superior way we smile at their futile labours to discover the philosopher's stone, but the tremendous results reached by them must not be lost sight of. The theory of the philosopher's stone was shown to be a false theory; but what of that? Probably many of the theories now held are false, but they are none the less valuable. An idea is of value if it leads to active work. Working hypotheses are the stepping-stones of intellectual progress. The philosopher's stone was more than a stepping-stone—it was a magnificent bridge. "Any idea," says Liebig, "which stimulates men to work, excites the perceptive faculty, and brings perseverance, is a gain for science, for it is work that leads to discoveries. The most lively imagination, the most profound wisdom, is not capable of suggesting a thought which could have acted more powerfully and lastingly upon the mind and powers of man than did the idea of the philosopher's stone. Without this idea chemistry could not exist to-day in its present perfection."

Let us now turn from the past to the present, and inquire, What is the province of a chemical laboratory in a university in this country? The first chemical laboratories had for their sole object the training of chemists, and consequently, the methods adopted in them were adapted to this end alone. Afterwards, and indeed only quite recently, the importance of laboratory training in chemistry for those looking forward to the study of medicine came to be recognised; and, still later, the idea that such training might be made a valuable part of a general education appeared. At present, then, a chemical laboratory is called upon to furnish opportunities (1) for the general student who does not expect to become either a technical chemist or a teacher of chemistry; (2) for the medical student; (3) for him who expects to devote himself to the practice of chemistry, either in a chemical factory or in an analytical laboratory; and (4) for him who is to devote his life to teaching and investigation. In addition to furnishing these opportunities, it should also be a place in which investigation is constantly carried on by the teachers and advanced students.

As regards the teaching of chemistry to general students much might be said, but it will be possible to touch upon only a few points on this occasion. Most of the teaching is of this kind, and the subject is under active discussion. There can be no question that much of the work done in schools and colleges is highly unsatisfactory, many of the courses which are called scientific are most unscientific, and the student is often more harmed than benefited by his work. If a course in a science, whatever that science may be, does not tend in some degree to develop a scientific habit of mind in the student, it is not serving its legitimate purpose. If the experience of twenty-one years in teaching in college and university in this country is worth anything, your speaker, who has during that time had to deal with many students from all parts of the country, is justified in asserting that the minds of students who enter college are very far from being scientific, and the same can be said of most of those fresh from the colleges. By a scientific mind is meant one that tends to deal with questions objectively, to judge things on their merits, and that does not tend to prejudge every question by the aid of ideas formed independently of the things themselves. Perhaps an anecdote, though trivial, will make this clearer. In a book used by my classes for a number of years, there was one error that served as a simple test of the condition of the students' minds. In the directions for performing a certain experiment, the statement was made that a blue solution would result at one stage. As a matter of fact, the solution referred to was always a bright green. Each student being required to write out an accurate description of what he had seen, each one in turn for a series of years described the green solution as blue, disregarding the evidence of his senses, and accepting the evidence of the printed word as more reliable. Occasionally one would appear whose conscience was troubled by the discrepancy, and who would boldly assert that the book must be wrong, but the number of these exceptions was insignificant. Surely this tendency to disregard the evidence of the senses is one that in the great majority of cases can be overcome. It would be better if it did not exist at all, and it probably would not exist if our educational methods were what they should be. We need teachers properly trained for carrying on scientific courses in our schools and colleges, and one of the most important branches of work in a university is the training of such teachers. Many of the courses in the schools and colleges are at present too ambitious. The attempt is made in them to do in a small way just what is done in a large way in the most advanced courses in universities. Instead of being what they should be, school courses and college courses, they are reduced university courses. Young men who have had the advantages of advanced courses feel so plainly the benefits they have received, that they naturally wish their own students in turn, whatever their ages may be, to get the same benefits. But time will not permit further discussion of this topic, and the main object in referring to it at all is to make it clear that the university laboratory has a great field of work in connection with the improvement of methods of teaching chemistry.

The teaching of chemistry to medical students suggests a number of thoughts, but they are rather of a special character, and this branch of our subject may be passed over with the remark that there is practical agreement as to this point, that what the medical student most needs at first is good scientific training, and that a course in general chemistry is well suited to this purpose. The most recently established medical schools require training in chemistry as one of the conditions of matriculation, and it is distinctly understood that it is chemistry, and not medical chemistry nor physiological chemistry, that is wanted.

The relation of the science of chemistry to the chemical industries is suggested by the next division of the subject. Here a most instructive object lesson was afforded during the past summer by a visit to the chemical exhibits in Jackson Park, where for the time being the products of the earth were concentrated. If you had had an intelligent chemical guide he would have pointed out many an interesting product from England, France, Russia, Italy, and this country, but his enthusiasm would have been reserved for the exhibit of the German chemical industries. He would have pointed out a great variety of beautiful and valuable products, and you would, I am sure, have carried away with you the conviction that the Germans excel the world in this line of work. The reason is not hard to find. It has often been discussed, but it would not be right to let this opportunity pass without again calling attention to it. Those who are familiar with the subject do not hesitate to acknowledge that the reason why the chemical industries have reached such a flourishing condition in Germany is that the pure science has been so assiduously cultivated. The value of pure science in the industries has long been recognised there, much more clearly than in any other country, and the scientific method has become established in the factories much to their advantage. Men deeply versed in pure chemistry, whose minds have been clarified by training in the university laboratories, are eagerly sought for in the factories. So thoroughly convinced are the Germans of the value of pure science for the industries that in the polytechnic schools, the plan of instruction in chemistry is essentially the same as in the universities, and some of the best purely scientific work is done in the laboratories of these polytechnic schools. We, in this country, have yet to learn the importance of this relation between science and industry, though undoubtedly some progress has been made in this line. We still endeavour to make iron and steel chemists, and soap chemists, and sugar chemists, and turn out hosts of raw products that are not worth their salt. Training along such narrow lines is a positive injury to the students. They are the victims of false pretences Let the training be as broad as possible and as thorough as possible, and the student will at least not be crippled when he ought to be strengthened.

Finally, a few words in regard to what is commonly and properly spoken of as the highest work of the university laboratory—the training of teachers and investigators. Here, again, we find that Germany leads the world, and to her we must look for guidance; and, as is well known, to her we have looked for guidance for many years past. Just as Liebig betook himself to Paris, and Wöhler to Stockholm, so in turn Americans have betaken themselves to Germany to work with the great masters. This movement began soon after the establishment of the Giessen laboratory, and many an American obtained his inspiration in that laboratory. There are living to-day a number of American chemists who sat at Liebig's feet; a still larger number look back with pride to the time spent in the Göttingen laboratory, where Wöhler's was for many years the master mind. Bunsen and Hofmann attracted large numbers in their best days; and now Bayer in Munich, Ostwald in Leipsic, Victor Meyer in Heidelberg, and Fischer in Berlin, appear to exert the strongest influence upon American students. Most of the chemists holding prominent places in this country have had more or less prolonged training in German universities, and it is not to be wondered at, therefore, that German methods have found their way into our laboratories. Indeed, there are some who appear to hold that, unless a method has a German tag on it, it is not worth considering. These hold, also, that the goal to strive for is the development of a laboratory like the best in Germany.

For many years Americans have been returning to this country after having enjoyed the best opportunities afforded abroad. Each annual crop have at least one thought in common, and that is, that chemistry in this country is in a deplorable condition, and that their labours are needed to bring about a reform. These young reformers are, of course, quite out of joint with the country, and often render themselves incapable of bringing about the results they desire, by refusing to recognise what is good and endeavouring to build upon that. The true and efficient reformer is a believer in continuity. Progress has always been by easy stages. The history of chemistry in this country shows that there has been a slow and steady advancement, and there is much promise in the present.

We owe to Germany very largely the investigating tendency which is showing itself more and more every year, and while even now the amount of original work done, as compared with that done abroad, is small, it is quite natural that it should be so.

A large part of the experimental work in Germany is done by advanced students and young chemists who are waiting for positions. It is by the aid of the former class especially that the professors work out their problems. Now, the number of advanced students of chemistry in this country is much smaller than in Germany, and the same is true even to a still greater degree of young chemists waiting for positions. Increase the number of these two classes here, and the amount of investigating work will be increased accordingly. But such increase must be determined largely by the demand, and the demand for thoroughly trained chemists is by no means as large as in Germany. The most important reason for this has already been spoken of. The value of these thoroughly trained chemists in the industries has not yet been generally recognised. Indeed, those particular industries in which the aid of scientific chemists is specially needed do not exist to any great extent, so that there is very little demand for such men. Most of the advanced students are looking forward to teaching, and the graduate departments in our universities must for years to come look to these men for re-enforcement. Plainly, the number of such students must be comparatively limited, or the supply will exceed the demand. After completing their regular courses these students must secure occupation. The "bread and butter question" is involved. But the number of places to be filled is limited, and every year young men well fitted to take good places are left, at least for a time, without means of support, and all their efforts must go to securing positions; and, further, when they secure their places, the conditions are for the most part unfavourable to the carrying on of higher work, and although many of them struggle manfully for a time to keep up their enthusiasm, it gradually dies out for want of nourishment.

All this is discouraging, of course, to the advanced students of chemistry, and to those who wish to study chemistry, and thus the number is necessarily kept down. It is a fair question whether the number of graduates now studying chemistry is not unnaturally large. However this may be, it is clear that, as the amount of investigating work depends upon the number of advanced students, the amount of this work must of necessity be comparatively small. More could be done, no doubt, by teachers in colleges throughout the land, and the amount done by these teachers is increasing year by year, but it is difficult for them to secure co-workers, and, with unaided hands, the amount of chemical work that can be done by an individual is small.

Some of the most active workers in Germany are, as has been remarked, the young chemists, who are waiting for positions. These form a comparatively large class of picked men—men who have a strong tendency to investigation, and in some way see their way clear to at least a sufficient income to "keep body and soul together." Most of them have a hard struggle, though, on the other hand, some are men of means, whose ambition is not destroyed by the fact that they have fortunes. These men, of course, are desirous of securing advancement, and they know that their only chance lies in doing good work. It is the tremendous competition among these men that leads to the results for which Germany is famed.

Very well, you will say, if that is the secret, let us have that system here. But that is the very thing we cannot get. We may be able to secure a few able professors, a number of bright advanced students, good laboratories, and supplies, but this intermediate class of active workers cannot be secured, save under conditions that do not exist here, and are not likely to exist here for many years to come. Abroad the university career is one of the most attractive open to men; a professor is a very much respected member of the community, and his life is an unusually pleasant one. Without entering into a detailed comparison between the university career in this country and abroad, we may accept the general statement that this career exerts a much stronger attraction upon students there than here. Then, too, the opportunities in other fields are more limited there, so that these two forces working together, lead a number of the ablest young men to choose the university career, and to face the great difficulties which they know they will have to overcome before they attain success. The first condition of that success is good work done. There is absolutely no chance for one who does not carry on investigation, nor for one who is lukewarm in his work. The school is a merciless one, but the results probably justify the means.

What possibility is there of introducing this system in this country? Let the experiment be tried. Offer young men of ability the privilege of teaching in a university and nothing else, and how many, think you, will avail themselves of it? Or if some few exceptional men under most exceptional conditions should do so, how long will they remain in the position? To keep them it will be necessary to pay them at least enough to live on, and then the very soul of the German system is destroyed. In short, we have our own problems to work out under conditions that we cannot control, and while we may be inclined to regret that we cannot have all that we should like to have; while we in this generation at least must necessarily be content to do with less scientific work than those who have breathed the German atmosphere have been accustomed to, there is pleasure in working out new educational problems, and there is satisfaction in causing the tree of knowledge to grow where before it languished. We have a great field to cultivate. It is fertile Labour expended upon it will yield rich harvests. So let us to work. Those who have been in the chemical field for years welcome the new workers, and especially such a body of workers as has been brought together in this University. May the great activity in chemical work which has characterised this University during its short life continue unabated. The Kent Chemical Laboratory is already known of all the world, even before its doors are open. May its fame increase year by year.